February 1, 1963

Dr. R. H. Dicke
Palmer Physical Laboratory
Princeton University
Princeton, New Jersey

Dear Dr. Dicke:

Thank you for your reply of January 16,,

I hardly know how to begin to answer your question about the thermal stability of amino acids. The fact that some environments now exist on the earth that overlap the conditions that you postulate and that these environments are even now populated by contemporary organisms seems to me to both answer your question and make it difficult to rely on any evidence of contemporary biochemistry concerning geological conditions of temperature. The ultimate limiting factor, it seems to me, is not so much the stability of individual amino acids, but the availability of liquid water to serve as a solvent for biochemical reaction. After that I would think the stability of the secondary structure of proteins, that is, their resistance to thermal collapse and denaturation, would still override the known thermal stabilities of amino acids over the lifetimes of individual organisms. Some stress should be put on the matter of heterogeneity--even if the average temperature of the earth was very much higher than it is now, surely there would still be some niches which had a more tolerable and lower local temperature.

Sincerely yours,

Joshua Lederberg
Professor of Genetics

Dicke